

Overview of ISR Alignment Requirements

Axial Line

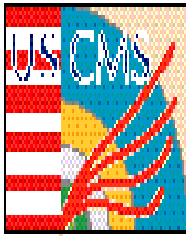
- LDM w/ 4° optics
- 3 Flat + 1 Bi-Directional DCOPS Sensors across 18m from Z+ encap

SLM Line

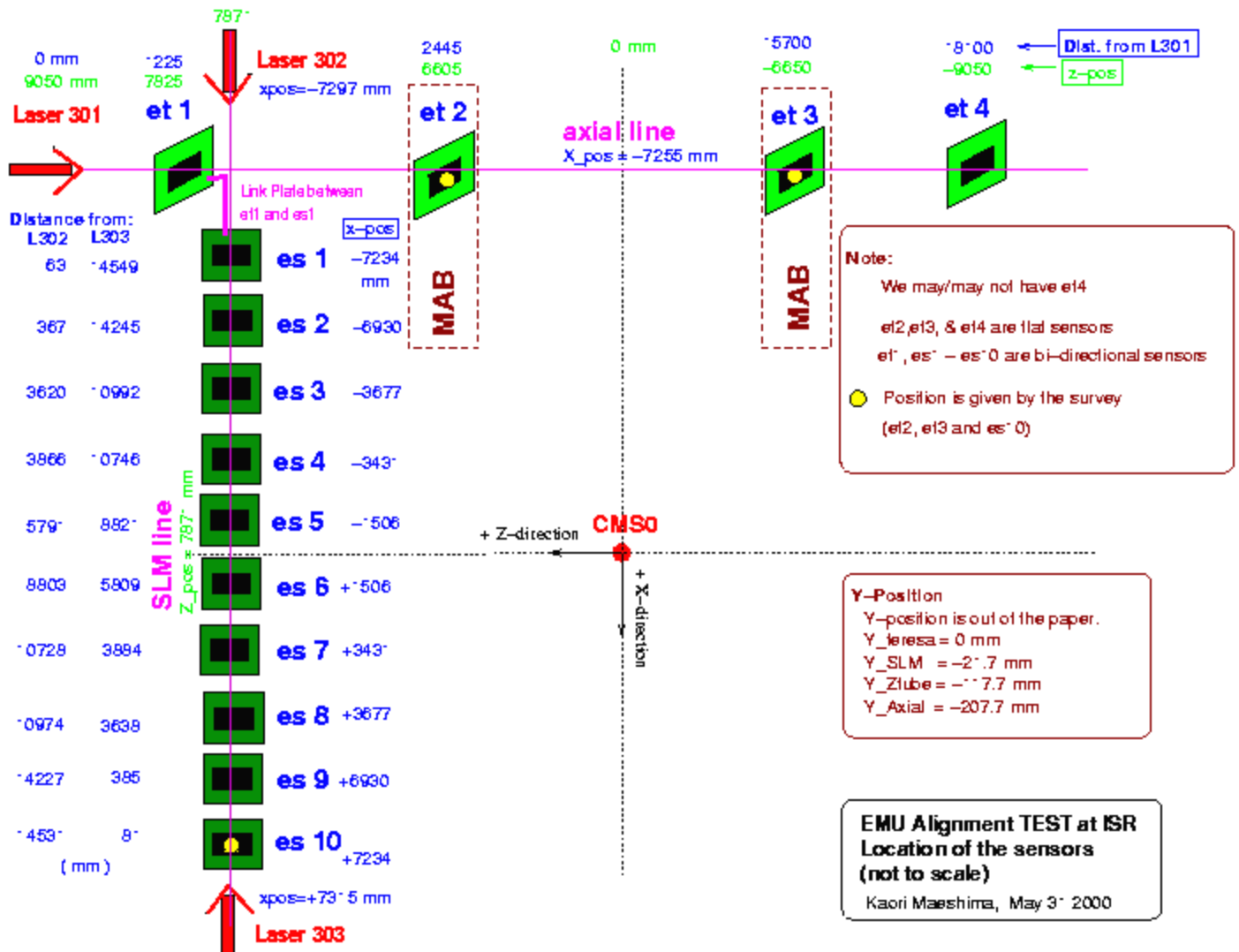
- LDM w/ 45 ° optics
- 10 Bi-Directional DCOPS Sensors across 14m
- Measurements to be made from both +X and -X directions

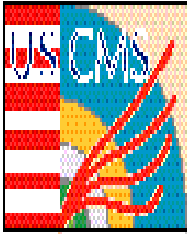
Transfer Plate

- Provides mechanical transfer of Axial Line to SLM Line
- Analog sensors to monitor plate orientation and R,Z position of components



EMU ISR Alignment Test Setup





Recent Progress on DCOP Sensor Development

Development and testing of 10 new DCOPS boards is complete (PNPI/FNAL)

Revised EPROMS code (PNPI/FNAL)

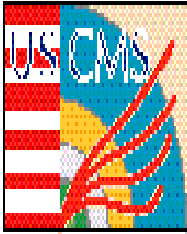
- New triggering/readout system is 400% faster
 - Acquisition of CCD Data is now done in parallel
 - Readout of CCD Data from all sensors can now be streamed from one command
- Sensors are now more robust than earlier versions

Revised UART's (PNPI/FNAL)

- Transmission through UART's are now buffered, thus eliminating data corruption between DCOPS – PC

12 Sensor DCOP Daisy Chain Tested (FNAL)

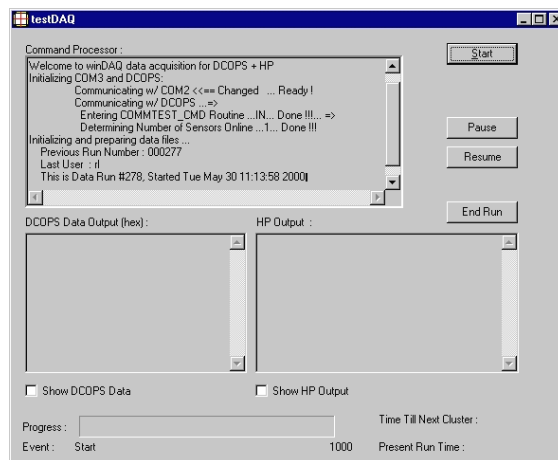
- 18+m daisy chain readout confirmed
- 8+m CCD window/board operation confirmed
- Reliability and Data Transmission Errors Investigated (all fine)



DAQ Development

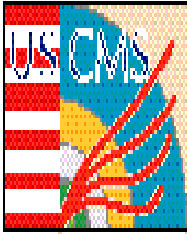
Implementation of SLM ISR DAQ Program

- **DAQ Program completed and tested (FNAL)**
 - Acquires all DCOPS CCD and Analog Data
 - Acquires all Transfer Plate Data
 - Prepares raw data for analysis
- **All DCOPS CCD data stored for offline analysis (no position measurement)**



DAQ Description

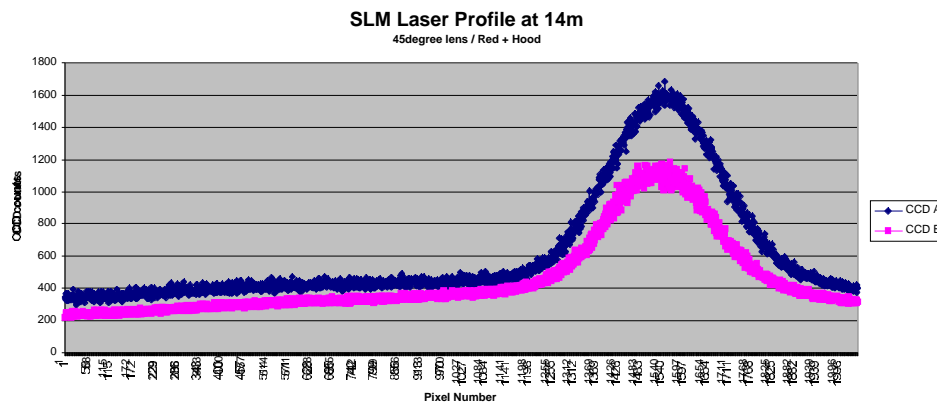
- **Win98 operating environment**
- **Serial connection to DCOPS Sensors**
- **HP Data Acquisition/Switch Unit via serial connection to analog sensor (temperature, Z, R, and transfer plate sensors)**



CCD Filter Development & Sensor Calibration

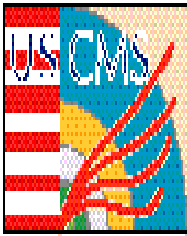
Temporary Filter scheme has been devised and tested for flat and bi-directional CCDs (NEU)

- DCOPS CCDs will saturate in ambient lighting and over-saturate in laser
- Filters must change as LDM intensity falls off
- Bi-directional CCD Windows require different filters on each side



LDM Optics and Filter combinations have been verified for all relevant distances including 18m axial line and 14m SLM line (NEU/FNAL)

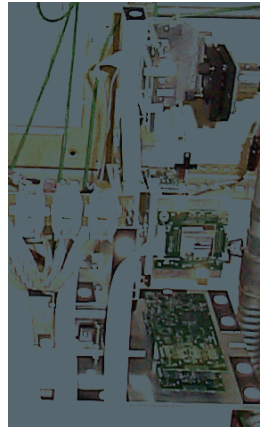
CCD Pixel/Dowel Pin Relationship Established (NEU)



Transfer Plate and Photogrammetry

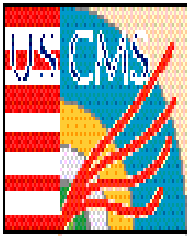
Transfer Plate Assembly (FNAL)

- Assembly of Transfer Plate completed and installed on test bench
- Calibration and testing of analog sensors complete (R, Z, T)



Transfer Plate Photogrammetry Completed (FNAL)

- Dowel Pin / Photogrammetry Target Relationships Established by V-Stars Photogrammetry and CMM Measurement
- CMM Measurements of Transfer Plate Sensors
- CMM Measurement of ME 2/2 R CSC



Present DCOPS / DAQ Status

Calibration and preparation of DCOPS CCD windows for ISR Tests (NEU)

- ï Measurement of relevant parameters
- ï Application of Filters for CCDs

Construction of new boards

- ï 5 new DCOPS boards completed at FNAL (May)
- ï Debugging and Testing of these boards will continue till 12 June at FNAL
- ï Will have 14 new boards for ISR and 2 older, compatible boards for backup.

Continued Development of Software

- ï Finalization of First Level Analysis Program [FLAP] to translate raw data to local pixel positions and analog sensor data to local position (FNAL)
- ï Development of Second Level Analysis Program [SLAP] to translate FLAP data to CMS coordinate system (NEU)

Detailed Status of ISR Alignment Plans, Transfer Plate Calibration, and Full Documentation available at:
<http://home.fnal.gov/~maeshima/alignment/isr.html>